

REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1, 2 and 4-17 are currently pending in the application; Claims 5-17 having been previously withdrawn from consideration. No claim amendments are presented, thus, no new matter is added.

As an initial matter, Applicants respectfully request acknowledgement the IDS filed June 27, 2005. A copy of the date stamped filing receipt along with the filed IDS are enclosed for the Examiner's convenience.

The outstanding Office Action, Claims 1, 2, and 4 were rejected under 35 U.S.C. § 102(b) as being anticipated by Mitani et al. (U.S. Patent No. 6,191,463). Applicant respectfully traverses this rejection.

Independent Claim 1 relates to the structure of a semiconductor device in which the hard breakdown lifetime of the gate dielectric film can be lengthened by causing the gate dielectric film to endure a soft breakdown. Specifically, the concentration of impurity in the gate dielectric film is intentionally fluctuated to cause the soft breakdown of the gate dielectric film to occur.

Specifically, independent Claim 1 recites, *inter alia*, a semiconductor device, comprising:

...an insulating layer containing impurity atoms in such a manner that a concentration thereof is non-uniformly distributed... wherein ***a maximum concentration of the impurity atoms in the surface is equal to or greater than twice a minimum concentration thereof.***

As noted in the previous response, Applicant has experimentally confirmed that the dielectric breakdown of the gate dielectric film is maintained to be within the range of the soft breakdown, if ***the maximum concentration of the impurity is equal to or greater than***

***twice the minimum concentration thereof.*** Thus, according to the structure of the semiconductor device as recited in amended Claim 1, it is possible to lengthen the lifetime of the gate dielectric film.

In addressing the above-emphasized claimed feature, the outstanding Official Action relies on col. 37, lines 1-10 of Mitani, and asserts that this reference “teach that the highest concentration ( $1 \times 10^{21}$ ) of the impurity atoms of insulating layer or gate insulator is equal to or greater than twice a lowest concentration ( $1 \times 10^{20}$ ).” Applicants respectfully traverse this assertion.

The cited portion of Mitani describes that the halogen element concentration in a gate insulating film reaches its maximum value at the two ends in the channel direction. Mitani, then describes that the maximum halogen element concentration in the gate insulating film ranges from  $10^{20} \text{ cm}^{-3}$  to  $10^{21} \text{ cm}^{-3}$ . In other words, Mitani prescribes only the range of the maximum halogen element concentration, but fails to provide any indication of the minimum halogen element concentration in the gate insulating film.

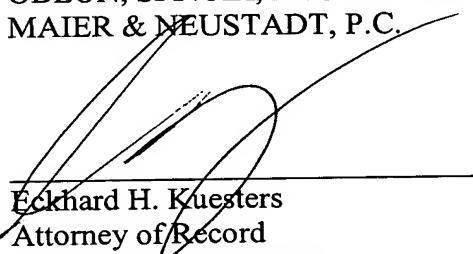
Specifically, Mitani fails to describe a minimum impurity concentration level and, therefore, Mitani fails to teach or suggest any relationship between the minimum and maximum impurity levels in his gate insulating film. Therefore, Mitani fails to teach or suggest “an insulating layer containing impurity atoms in such a manner that a concentration thereof is non-uniformly distributed... wherein ***a maximum concentration of the impurity atoms in the surface is equal to or greater than twice a minimum concentration thereof***”, as recited in independent Claim 1.

Accordingly, Applicant respectfully requests that the rejection of Claim 1 under 35 U.S.C. § 102(b) be withdrawn. Further, as Claims 2 and 4 depend from amended Claim 1, it is also submitted that these claims patentably define over Mitani.

Consequently, in view of the present amendment and in light of the foregoing comments, it is respectfully submitted that the invention defined by Claims 1, 2 and 4 is definite and patentably distinguishing over the applied references. The present application is therefore believed to be in condition for formal allowance and an early and favorable reconsideration of the application is therefore requested.

Respectfully submitted,

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